AGRICULTURAL NEWS LETTER

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This publication contains information regarding new developments of interest to agriculture based on laboratory and field investigations by the Du Pont Company. It also contains published reports of investigators at agricultural experiment stations and other institutions as related to the Company's products and other subjects of agricultural interest.

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AGRICULTURAL NEWS LETTER

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THE AGRICULTURAL NEWS LETTER serves as a medium of reporting new developments and ideas in agriculture, particularly those related to advancements through research. Material herein may be reprinted, in whole or in part, in the interest of advancing the general knowledge of new agricultural practices.

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OTTO J. DEKOM.....*Editor*

Farm and business economics having entered the political arena as major issues, today's hustings are more likely to echo statistics than to ring with oratorical brilliance. As with many other technical subjects gone popular, the scientific basis is lost in the transmutation and the "statistical" evidence become a means of proving a foregone conclusion rather than a tool for objective analysis.

A good example is the volume of statistics intended to show that there is an undesirable degree of "concentration" in business and farming and that drastic economic surgery is needed to break it up. In agriculture the "evidence" is that larger farms (those with sales of $2,500 or better) account for 76 per cent of the farm acreage and 91 per cent of the sales dollars—even though they constitute only 44 per cent of the number of farms. The remaining 56 per cent, on the other hand, receive only nine per cent of the sales dollars.

This science of (for want of a better name) "percentmanship" can be easily extended to the business field. In fact, a Senate subcommittee developed something called a "concentration ratio," that is the percentage of business done by a specified number of large companies. In aircraft propeller manufacture, for instance, the eight largest firms do 96 per cent of the business. But, in production of "5-cent and 10-cent candies, except bars and cough drops," the same number of companies do only 54 per cent of the business. And, in manufacture of wood caskets and coffins, the big eight account for 27 per cent of the shipments. It is to be regretted by the serious student of economics that the subcommittee "provides no standard for evaluating these facts."

Interesting as the science of percentmanship may be, it lacks significance. The size or nature of a producing unit, whether it is producing crops or manufactured products, cannot be decided by abstract mathematics. It has a practical foundation. It is hardly practical, for example, to expect an aircraft plant at the edge of every one of the 6,000 airports in the U.S. Or, a tank plant for every National Guard unit. Nor is it conceivable that automobiles should be produced by the service shop that lubricates your car every 1,000 miles.

So, it seems obvious that, although a mathematical ratio is useful in many ways, it cannot by itself provide any useful guide to the optimum number of farms or business establishments. The size of a farm or business is not determined in a vacuum of political theory but within the practical atmosphere of the job that it must do.

IN THIS ISSUE

DIETARY DEFICIENCY and CHICK METABOLISM

J. T. Baldini, Ph.D.
Stine Laboratory
E. I. du Pont de Nemours and Co. (Inc.)

New research studies at the Du Pont Company's Stine Laboratory have provided conclusive evidence that chickens fed a poorly balanced diet will waste calories in heat production rather than use them for growth. A number of previous studies have reported productive energy of deficient rations is decreased, even though the total metabolizable energy may remain constant.

With adoption of high-calorie poultry feeds in the past decade, calorie content has become an important measure of the economic value of commercial feeds. This measure is not, however, an accurate gauge of potential production if efficient conversion of the calorie content to meat cannot be achieved. The Du Pont experiments were designed to study the energy metabolism of chicks fed a diet deficient in methionine, one of the 10 essential amino acids, compared with those fed the same diet supplemented with methionine. The average metabolizable energy value was greater for the deficient diet than for the supplemented feed by a statistically significant difference.

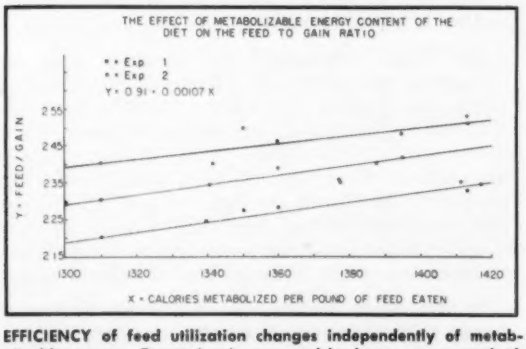
A series of two experiments was undertaken to measure metabolic reaction. Samples of feed and chicken were taken at appropriate periods for analysis. The observed better growth and feed utilization in the methionine-supplemented chicks was confirmed by the experimental data, showing that the productive energy value of a diet is related to the ability of that diet to support growth.

Since the study showed efficient metabolism of the caloric content of both diets, it was decided to determine the extent to which the birds on the deficient diet were producing more body heat, rather than storing energy in the body. During the eight weeks of each experiment, deficient birds were found to give off 14 per cent more heat than chicks on supplemented feed.

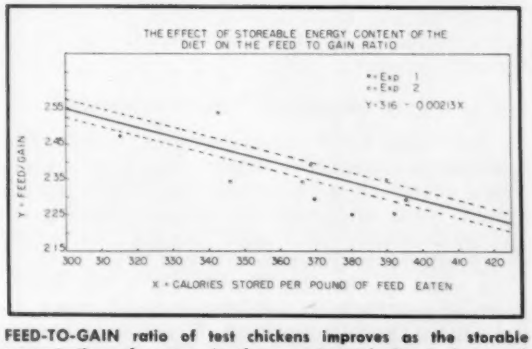
Further experiments were then conducted on the relative consumption of oxygen. Oxygen volume consumption of the deficient chicks ranged from 7.4 to 14.7 per cent higher per unit of body weight. An experiment was then run to overcome the influence of differences in body weight on the result. It was found that birds on the supplemented diet consumed about eight per cent less oxygen, even though they were slightly lighter than the birds on the deficient diet.

To determine whether or not this reaction was peculiar to a methionine-deficient diet, an additional experiment was undertaken with ground yellow corn as the comparison diet. Chicks on the complete diet consumed 14 per cent less oxygen, indicating that the imbalance in diet was the responsible factor.

The experimental data were also used to study the relation of diet energy content to efficiency of feed utilization. As shown by the accompanying graphs, the correlation of feed efficiency to metabolizable energy is not statistically significant, whereas the relation to storable energy is highly significant. Thus, it is possible to make a good estimate of bird growth from knowledge of the determined productive energy value of a diet, whereas a knowledge of the metabolizable energy value is not adequate for making such an estimate.



EFFICIENCY of feed utilization changes independently of metabolizable energy. Regression is computed by least squares method.



FEED-TO-GAIN ratio of test chickens improves as the storable concentration of energy in the experimental diet is increased.

Research . . . A DU PONT TRADITION

RESEARCH has been an important part of the Du Pont program since the company was founded in 1802. Many improvements in the powders and other explosives which helped build and defend America came from early research work. Prior to establishment of the formal program of today, this activity was carried out in plant laboratories. The first company research laboratory, built in 1902, was one of the earliest in U. S. industry.

In 1903, the Experimental Station was set up near the site of the original powder mills. As shown in the panoramic view above, the Station is now a complex of many laboratory buildings with an investment running over $71 million. Du Pont research has expanded rapidly into many fields and employs about 2,200 technical employees.

In 1927, Du Pont launched a pioneering activity in industry, fundamental research — the search for basic scientific knowledge without specific commercial objective. From that beginning, basic research has become a "way of life" with Du Pont and each of the company's 12 industrial departments has a program of its own. In addition, there is a Central Research Department devoted to long-range investigations. Close to $15 million of Du Pont's $90-million research and development budget is allocated to fundamental research.

More Important Than Dividends

Du Pont's ability to support large-scale fundamental research is largely due to the broad base of its chemical manufacturing establishment. Thus, a number of findings growing out of the fundamental research program have been translated into commercially practical products. The most spectacular illustration is the fundamental research on condensation polymers begun more than 30 years ago. These studies were the basis for discovery of nylon, films, polyurethanes, and dozens of other products of commercial importance today.

One of the principal features of Du Pont research policy is the emphasis on this activity despite changing business conditions. During the depression days of 1932, for instance, President Lammot du Pont stated that "it is more important to carry out research than to pay dividends."

The fundamental research program is highly diversified, including such fields as animal biochemistry, ferromagnetism, fluid mechanics of high viscosity materials, genetics, microbiology, physical electronics, radiation chemistry, solid state physics, virology, and others. The accompanying illustrations show some of the work in progress.

Fundamental Research Program

A substantial part of Du Pont's fundamental and applied research program has been devoted to agriculture. This work has represented a creative contribution to pesticide development programs. The Company introduced the substituted urea herbicides and methoxychlor insecticides, and it has made principal contributions to the dithiocarbamate fungicides and 2, 4-D.

Du Pont originated a research program toward development of effective fungicides in 1923. About eight years later, its scientists discovered the fungicidal properties of some derivatives of dithiocarbamic acid. Many of these compounds were synthesized specifically for trial and developed as agricultural chemicals. The alkyl derivatives, especially the methyl and ethyl thiuramdisulfides, and the methyl dithiocarbamates, were outstanding in effectiveness.

In the early 1930's, the Du Pont Company began a fundamental research program seeking to discover new compounds which would have

biological effects on living organisms. One of the first projects in this field was a study of the relationship between plant growth activity and chemical structure, which led to the discovery of 2,4-D. In the original Du Pont research with derivatives of dichlorophenexyacetic acid, as growth regulators, it was found that slight overdoses killed certain plant species. When the compounds were evaluated as selective weed killers, they were found to kill broad-leaved weeds without harming many members of the grass family. This was a long-sought weed killer for use in grassland, small grains, and corn, and 2,4-D came into widespread agricultural use.*

The work with growth regulators eventually led to discovery of the substituted urea herbicides, a family of chemicals which have powerful and versatile biological effects on plants. At the cost of several million dollars, Du Pont researchers have prepared and studied over a thousand compounds over a ten-year period.

The first substituted urea to reach commercial use was monuron, 3-(p-chlorophenyl)-1, 1-dimethylurea. After herbicidal properties of this virtually insoluble compound were demonstrated in the laboratory, extended field trials were undertaken and a commercial formulation placed on the market in 1952.

Properties of Methoxychlor

The insecticidal properties of methoxychlor were discovered during research for residual insecticides with a high safety factor. It was synthesized for insecticidal tests before DDT was used in this country. When DDT came into prominence, it was recognized by Du Pont as an analog of methoxychlor. The properties of methoxychlor are similar to those of DDT, but it has only 1/30 the toxicity to warm-blooded animals, and is not stored in body tissues.

Du Pont's research has also made substantial contributions to seed protectant chemicals, to development of fertilizers and feed supplements, and to other products important to agriculture. In addition to the laboratory facilities available for fundamental and applied research, the Company maintains Stine Laboratory near Wilmington, Del., where new developments are tested on crops and animals under field conditions. Naturally, biological chemicals are also subjected to extensive tests in experiment stations and by established growers before commercialization is undertaken.†

FIBER FORMING polymer discovered in 1930 under Du Pont's fundamental research program led to manufacture of first true synthetic fiber, nylon. The Company spends $15 million for basic research.

PHARMACOLOGY is one of areas for Du Pont basic research. Experiment with white mice is aimed at providing clearer understanding of interaction between chemicals and the animal body.

VIROLOGY STUDIES at Du Pont's Stine Laboratory use Warburg respirator. Researchers are probing for greater understanding of viruses which may lead to new chemicals for control of viruses.

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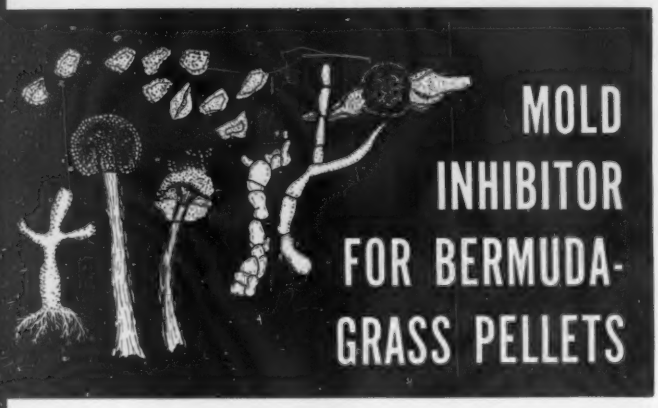
* *Another important result of the Du Pont fundamental research program is discovery of the secret of nitrogen fixing by bacteria. Details of this major scientific breakthrough were reported in the Summer 1960, Vol. 28:2, issue of the* Agricultural News Letter, *copies of which may be obtained without cost from: Editor,* Agricultural News Letter, *Du Pont Company, Wilmington 98, Del.*

† *See story on page 8.*



MOLD INHIBITOR FOR BERMUDA-GRASS PELLETS

By A. M. Hyson, Ph.D.
Research Division
Industrial & Biochemicals Department
E. I. du Pont de Nemours & Co. (Inc.)

Properly harvested Coastal Bermuda grass can replace an equal weight of alfalfa meal as a source of vitamin A and minerals in poultry feed. When harvested at three to four weeks, it may contain more than 200,000 units of vitamin A equivalent per pound in the form of carotene. Furthermore, the crude protein content of good quality grass may range between 15 and 19 per cent.

These findings may bring about substantial changes in the formulation of poultry feeds in the Southeast, resulting in substantial economies to poultrymen. The fortification of poultry feeds with necessary vitamin A precursors normally requires importation of alfalfa meal, because the area is not suited for local growth of alfalfa, Bermuda grass can however, be grown readily in the southeast, and its use would eliminate the cost of shipping from the West. Yields can be quite good — up to 13 tons per acre — because there is an almost linear response to fertilization.

Dehydrating Process Developed

Several processors, especially in Georgia and South Carolina, are developing processes to dehydrate and pellet Bermuda for use in poultry feeds. Because of the seasonal nature of grass harvesting, pellets must be stored as long as six months for year-round use. Thus, the problems of oxidation of carotene and mold development during storage in the warm, humid southern climate must be solved. Mold adversely affects both the nutritive value of pellets and their palatability. Some mold organisms may also cause serious poultry disorders, aspergillosis and moldy-crop, for example. Even a trace of invisible mold may result in serious economic loss.

Carotene losses can be minimized through use of specific anti-oxidants. The problem of mold inhibition has been under study for the past five years at the Du Pont Experimental Station near Wilmington, Del. The work shows that "Impedex" sodium propionate mold inhibitor effectively controls the growth of mold and the resulting heating of feed.

Coastal Bermuda pellets containing up to 15 per cent moisture and stored at 90° F. were protected for six months by six pounds of "Impedex" per ton of pellets. In the absence of inhibitor, the pellets began to mold soon after storage. Although pellets may be relatively dry when produced, they pick up moisture rapidly if exposed to humid air. A moisture level of 12 to 15 per cent could be reached in a few days with resulting mold and heating problems in the absence of any fungistatic agent.

Used by the Feed Industry

Sodium propionate has been used as a fungistat for several years by some segments of the feed industry. It has proven effective in controlling mold development in a wide variety of feedstuffs. It has been extremely useful in feeds shipped for relatively long distances during warm weather, particularly those destined for export. This wide usage has proven both the utility of "Impedex" and its harmlessness to fowl or animals. "Impedex" is completely metabolized in the animal body and, indeed, is a source of energy.

The official publication of the Association of American Feed Control Officials, Inc. (1960) lists sodium propionate as an accepted mold inhibitor.

BOOK TELLS STORY OF PRICES

Prices are a subject of national concern, but in themselves they have little meaning. To be useful as a yardstick in the U.S. market, prices must be related to the economic structure, and expressed in terms of the true values they represent. This is the theme of *The Story of Prices*, a new booklet in the "This Is Du Pont" series. It points out that a price tag is no more than a convenient symbol which reflects the consumer's economic status only if translated into purchasing power. The booklet explains how purchasing power has climbed in recent years, despite the rise in prices, and outlines factors responsible for this progress. Noting that prices have been a problem for hundreds of years, it explains the changes that have transformed the price structure in the past few decades. A copy may be obtained from: Editor, *Agricultural News Letter*, Du Pont Company, Wilmington 98, Del.

Vaccination Against Parasitic Worms

By Donald C. Boughton, Ph.D.
Industrial & Biochemicals Department
E. I. du Pont de Nemours & Co. (Inc.)

Recent research on immunity has lead to a practical procedure for vaccinating calves against lungworms. Based on the use of irradiated larval worms as the immunizing agent, this breakthrough suggests "that further vaccines similar to the one against parasitic bronchitis will be produced" and offers "the possibility of not only prophylaxis against the effects of outbreaks by individual species (of worms), but also the theoretical possibility of eliminating certain parasites completely.[1]"

It has been known for many years that parasitic worms elicit immune responses in their hosts, even to the extent of "self-cure" and of complete protection from reinfection. Acquisition of immunity to worms by natural means, however, is relatively slow and requires severe infection. This makes it too unpredictable and too costly for use in efficient livestock production. To count on it is unsound husbandry.

Immunity Without Damage

The problem has been to get the immunity without the beating Mother Nature's method requires. For the lungworms of cattle, *Dictyocaulus viviparus*, this has been solved by giving by mouth 1,000 to 4,000 infective larvae previously treated with a suitable dose of ionizing radiation. The latter prevents the normal development of the larvae as they migrate from the digestive tract to the lungs, with a consequent reduction in the damage to the host. The correct dose of radiation, does not however, seriously impair the capacity of the worms to stimulate an immune response. Thus, the new "vaccination" consists of introducing partially inactivated larvae, with only their undesirable pathogenic capability curtailed.

The general results obtained are illustrated by the following excerpts from the research. Calves given 4,000 non-irradiated larvae developed severe lungworm infections with an average of 906 adult worms. Such calves, when given a subsequent challenge dose of similar non-treated larvae, proved to be resistant; they experienced only mild infections with an average of only 11.4 adult worms. On the other hand, calves given 4,000 larvae previously treated with an x-ray dose of 40,000 roentgens did not develop severe infections; their average adult worm count was only two. Obviously, most of the treated larvae were prevented from reaching the lungs. Furthermore, calves previously given the same number of irradiated larvae proved to be resistant when challenged with 4,000 non-treated larvae; the resulting mild infections averaged only 13.6 adult worms. Apparently, the partially inactivated larvae of the immunizing dose retained their ability to stimulate the development of immunity.

Mechanism of Immunity

The mechanism of immune response to worms is presumed to be of the classical type, namely, antigenic substances derived from the worm stimulate the formation of corresponding antibodies in the host. Twenty years ago, the case for migrating larval forms was stated as follows: "The worm's secretions and excretions ... appear to be the main effective inflammatory stimuli and the effective antigens involved in immunization. Precipitins are formed by the immune host against the excretions and secretions of the worm and react with them to cause visible precipitation in the gut of the worm and around its extremities.[2]" The poor worm looks like a spirit medium extruding clouds of ectoplasm. It cannot move or feed. It dies and disintegrates.

References

[1] W. *Mulligan*. Australian Vet. J. *36: 176 (1960)*.

[2] W. *H. Taliaferro*. Am. J. Trop. Med. *20: 169 (1940)*.

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18 MOTION PICTURES AVAILABLE FROM DU PONT COMPANY

Eighteen motion pictures are now available from Du Pont for showings to schools and to social, civic, service clubs, and churches. Pictures include historical, professional, and product subjects. Information on these motion pictures, including data on running time, and highlights about the pictures are available in a new 28-page booklet. The booklet can be obtained from Motion Picture Section, Advertising Department, Du Pont Co., Wilmington 98, Del.

technical aspects of DEVELOPMENT AND REGISTRATION OF AGRICULTURAL CHEMICALS

By MILLARD C. SWINGLE*
Industrial and Biochemicals Department
E. I. du Pont de Nemours & Co. (Inc.)

Du Pont manufactures a large number of products useful to agriculture and is continually testing hundreds of new chemicals to discover their utility. Preliminary testing in the laboratory is called "screening" and simply results in the selection of a preferred list of chemicals for more advanced study. Over 99 per cent of these promising compounds are eliminated for a variety of reasons ranging from unsatisfactory performance to objectionable hazards. Compounds that show promise undergo secondary tests in which the requirements are more specific. For example, they may be sprayed on potted plants in the greenhouse. Thus, we are able to establish the more obvious limitations of the compound to do the job proposed. The program is now oriented toward extensive and more practical trials. Investigations study some of the major problems connected with the proposed use.

Preliminary toxicological studies are now initiated to learn to handle the compound safely and gain some knowledge of its comparative toxicity. Du Pont's Haskell Laboratory for Toxicology and Industrial Medicine conducts such studies on small laboratory animals to obtain data on both acute oral and skin absorption toxicity. If any major hazard is uncovered, the compound might be discarded or set aside for modification through chemical synthesis.

About this time, a chemical study is undertaken to develop a precise analytical method for quantitatively determining small amounts of the compound in the presence of organic matter. Without an accurate means of detecting fractions of a part per million, no progress could be made in estimating the degree of exposure from possible residues.

A third study is formulation, in which the chemical may be prepared as a dust, a pellet, a spray, or perhaps an aerosol, whichever experience indicates would be most suitable for use. Finding the desired formulation may be accomplished in a few weeks or it may take months, or even years, if the compound is unstable or otherwise is difficult to formulate.

A new crop insecticide or weed killer would next be tried in the field, using commercial equipment to determine necessary use information such as crops on which it may be employed, optimum rate of application, best time to apply, effect on crops, and other factors that will spell out proper use. These trials usually are conducted on Company-operated farms where the resulting crops can be destroyed or used in residue or yield studies. Treated crops are not allowed to enter commerce.

Often, qualified state and federal investigators are invited to try the new candidate to broaden the testing geographically, and under diverse conditions. By so doing, a mass of technical data are assembled on which to base decisions on the compound's utility, if it is safe to crops, if it should be offered commercially, and for proper use. Such investigations usually account for a second full year of research and may require the part-time services and technical "know-how" of scores of well-trained scientists in many organizations and areas.

This limited field testing makes it possible to begin the study of residues. When new compounds are extensively tested, Du Pont specialists act as coordinators. They inspect as many as possible of the test plots scattered over the country, study volumes of reports, and decide which crops appear to be the leading markets for the candidate product. Samples of crops from selected locations to be shipped to our laboratories for residue analyses. This may involve scores of samples of different crops to be packed, often in dry ice, and shipped from distant areas of the country. After weeks of work involving recovery studies and analysis, we obtain the necessary residue data.

At the end of a second year, we are ready to make a decision on whether to go ahead or begin again with another candidate. If our candidate has what it takes, we plunge into the third year of development to wrap up the information on which we have just made a good start. The scope of our toxicological research can now be broadened. Chronic feeding studies using rats and dogs are now undertaken to determine safe levels of possible ingestion.

The next move may be to request a USDA Experimental Permit, and, if food crops are involved, petition the FDA for a temporary tolerance to expand the trial use to a few cooperating farmers or appropriate consumers.

In the third season of work, it is possible to extend local trials to include progressive farmers or other ultimate users. Cooperators are selected for their ability to contribute to the fund of information, and trials are supervised by Du Pont or qualified state and federal investigators. Nothing is left to chance; all work is planned and coordinated.

* *Excerpts from an address before the (California) Governor's Committee on Public Policy Regarding Agricultural Chemicals, Los Angeles, Sept. 16, 1960.*

for rodents and wildlife
A WIDE SPECTRUM REPELLENT

Approach of winter makes essential measures to protect trees and ornamental shrubs against the depredations of rabbits, meadow mice, and deer. A recently-developed thiram formulation— "Arasan" 42-S seed disinfectant —provides effective repellent action. This is due apparently to its taste, since it has been found that some animals may take a nibble and then leave.

"Arasan" 42-S is a water suspension of fine particles, making the product suitable for application as a fine spray or with a brush. It is particularly safe to use on foliage. Application is recommended for the following groups of crops:

Nursery Stock: Young evergreens (2 years old) should be dipped in repellent before shipment for replanting in reforestration areas. Spraying is advised for ornamentals and other plants usually attacked by rabbits or mice. Protection of fruit trees is achieved through painting of the trunks with the chemical, plus a suitable sticking agent.

Farm Plants: Apple orchards should be sprayed, especially on the lower branches, to prevent attacks by browsing deer. Trunks of fruit trees, when painted from ground level up to the height of small animals, will protect against mice and rabbits. Ornamentals around the home may be sprayed.

Garden Plants: Young tulip and other bulbs should be sprayed after emergence from the ground, and tips should be kept covered with chemical until the danger of rabbit depredation has passed.

Cost of treatment with "Arasan" 42-S is relatively low. For example, when used as directed and applied with care, treatment of young trees (one inch in diameter) or the spraying of lower twigs will cost approximately $2.00 per acre.

Farm for Fun as Well as Profit

By J. P. LINDUSKA, Ph.D.
Director of Wildlife Management
Remington Arms Company, Inc.

Winter is the time when farmers finish repairing farm machinery, decide the spring cropping program, order fertilizer—and plan farm improvements for wildlife. A lot of game management gimmicks can be put into play ahead of the regular farm rush.

In lespedeza country, the best catches of game come from early planting, even February in the South, but a full month ahead of the earliest farm crop in any area. A mixture of one part Korean to three parts Sericea makes an ideal seeding for shaded field borders or as a turn-row on the edge of cropland. It makes a good hay crop and is excellent food and cover for many kinds of wildlife.

The low field that buries the tractor during spring plowing and bogs down the combine every fall might be worth considerably more as a farm pond. It can be managed for prime fishing spring and summer, and the ducks may take to using it come fall migrations. (Apparently some farmers enjoy them. Over two million have been built in the past twenty years.)

If the farmer is weary of fence-mending, he should look into multiflora rose as a solution to his problem. It is thrifty and tough and, once established, requires no maintenance. A double-row planting makes the best fence and maximum cover value to wildlife. And for trespass problems, no one will try going over, under, or through that wall of spines.

Wood ducks are early nesters and easily managed in most areas offering a bit of water. An artificial nesting cavity made from nail kegs or rough lumber is usually all it takes to get them started. But raccoons can be a problem in robbing the nests. Check with your Game Department for suggestions on 'coon-proofing the boxes if these agile and persistent predators are common in your area.

Hedges have a multi-purpose value and find a logical place on any farm. They retard wind, and with it, reduce evaporation and wind erosion. They hold snow in winter to conserve moisture, and the bug-eating songbirds produced in the summer work full time for the farmer. Rabbits, quail, and other wildlife use hedges, too. And, they do a lot to overcome the monotony of flat, open fields.

new PRODUCTS AND APPLICATIONS

A sunlight-resistant polyethylene film with outdoor life from three to four times that of regular clear polyethylene is made by Du Pont. This film, designated Sunlight Resistant polyethylene SR-300, has a four-mil thickness and is available in a variety of widths. Developed in Du Pont's research laboratories, SR-300 provides weatherability sought since polyethylene was first evaluated for agricultural and construction use following World War II. The film is intended primarily for green houses, cold frames, and farm buildings, as well as crop row covering to extend normal growing periods.

* * * * *

A new family of heavy-duty containers make possible temperature maintenance of hot or cold drinks for field crews or other workers in remote areas. The insulating material is urethane foam which is used as an effective heat barrier in refrigerators, storage rooms, clothes, and other applications. The containers are made of a heavy galvanized exterior with a replaceable polyethylene liner. A recessed faucet provides protection against damage and easy access to drinks. The containers are available in sizes of two, three, five, and 10 gallons.

* * * * *

A major change in merchandising of eastern-grown cauliflower was started in Genesee County (N. Y.) through use of a cellophane overwrap for fresh sale in retail outlets. Chief reasons for the development are prospective savings in transportation costs and greater convenience for both store and consumer. These factors induced western growers to trim and wrap an estimated 90 per cent of their fresh-marketed production last season, and now point to a similar trend in the East. It is reported that nearly twice as many heads can be shipped in each truckload when they are prepared for retail sale — offsetting much of the extra expense of packaging.

* * * * *

Packaging of onions and other produce requiring considerable ventilation at the producer level is made practical by Du Pont "Vexar" plastic netting. By allowing air to pass freely, these bags greatly extend the store and home shelf life of produce, making it more practical to package at the grower level, where costs are lower and shipping waste can be reduced. In less porous materials — such as perforated polyethylene bags — onions often sprout within a few days. The netting is made in tubular form and bags are formed by sewing a header label on one end and using a closure on the other.

* * * * *

A spray-on dry lubricant that provides ultra-smooth surfaces without staining, running, or picking up dirt, is being introduced by Du Pont. Called "Slipspray" all-purpose dry lubricant, it leaves no drips, blotches or sticky spots, eliminating the mess that often accompanies oil or graphite. Drying instantly when applied, it forms a sleek, solid film that transfers from the sprayed surface to any other material that rubs against it. The new lubricant may be used on all types of surfaces, including metal, paint, rubber, glass, plastic, and leather. Colorless and insoluble, it makes drawers, doors, windows, screens, and zippers slide easily and keeps them from jamming and sticking when not in use. It also serves as a corrosion retardant for battery terminals, stored tools, guns, skates, and other metal equipment.

"Telar" anti-freeze and summer coolant never needs to be drained from a properly operating automobile, truck, or tractor cooling system. Based on 25 years of anti-freeze research, Du Pont scientists developed a rust inhibitor that does not break down under the severe conditions in the cooling system, eliminating the need for annual drainage. "Telar" also incorporates a "Color-Check" to give warning of serious defects in the cooling system. The normal red color of "Telar" turns yellow if a head-gasket or similar defect contaminates the coolant. Because of the importance of a properly-operating cooling system to its effectiveness, "Telar" will be sold only through service stations.

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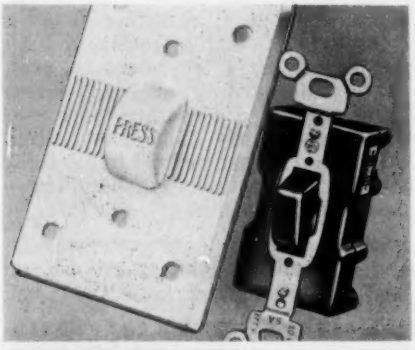

A weatherproof electric switch is suitable for outdoor farm use or in humid farm buildings — such as dairy buildings where steam is used. The steel-plate covering of the switch, including the actuator button, is sheathed in waterproof neoprene. Pressing of the molded "bubble" which covers the button turns the switch on or off. Neoprene is non-conductive and highly resistant to impact, aging, oil, grease, steam, temperature, and weather. The plate-and-switch combination is available in a variety of contacts and for FS or standard wall-box mounting.

* * * * *

Inexpensive shoes are available with the long-lasting soles used in expensive, special-duty work shoes. Soles of neoprene synthetic rubber, available for the first time in cloth-top footwear resist barnyard acids, farm chemicals, oils, abrasives, and other conditions that tend to wear out conventional soles. Furthermore, the sole is molded on as an integral part of the shoe, eliminating stitches or seams which may quickly wear out or deteriorate under farm conditions. Shoes are washable and have full-cushioned insoles. Colors are black, blue, and brown.

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Du Pont has developed contour bags of heat-shrinkable "Mylar" polyester film. The bags provide clear and strong skintight wraps for processed meat and poultry products. They are made from film of the same thickness, strength, and performance properties—except for shrinkability —as the 100-foot balloon satellite used for "Project Echo". Although "Mylar" has been offered in tubular form for some time, its wide use by the meat and poultry industries has depended upon bag fabrication. Success of this development, after three years research, now offers new possibilities for meat and poultry items to capitalize on the film's functional and merchandising advantages in the supermarket.

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A new plastic fastener will find many applications in the home and on the farm. The clip can be used to close plastic, fabric, and paper bags, including freezer bags, clothing bags, bags containing fertilizer, and many other products. Made of "Alathon" polyethylene resin, the unit is odorless, tasteless, chemically inert, and moisture resistant, making it applicable to most materials which may be used on the farm. The closure is simple to use and may be removed without tearing or damaging bags. The two-piece closure consists of an oval ring and a flat cap.

the nature and function of
SEED TREATING CHEMICALS

By T. C. Ryker, Ph.D.
Industrial & Biochemicals Department
E. I. du Pont de Nemours & Co. (Inc.)

SEED TREATMENT—once an on-the-farm function—has now become an integral part of commercial seed processing. This has assured greater uniformity of treatment and the application of more specialized techniques to special problems. But, this shift in responsibility has often made farmers less aware of their own special needs and has sometimes resulted in farmer acceptance of a treatment which may not have been the best for his particular problem. A general knowledge of seed treating materials and what they can do is, therefore, important in obtaining maximum productive efficiency out of the soil. The three major classes of treatment are organic mercurials, non-mercurials, and insecticides.

Organic Mercurials

The organic mercurials both disinfect and protect. They are used on seed not easily injured where disinfection is necessary or difficult. The volatile mercurials through their fume action serve two important functions: They contact all the seed surfaces, including underhull parts, to completely disinfect, and they are absorbed by seed surfaces as a complete retentive coating of the seed parts when the seed is planted. To obtain the full benefits of this volatility, treated seeds should be held at least 24 hours before planting. With longer storage, disinfection may be obtained with reduced dosage, but some protection is sacrificed. The fume action is not so important on wheat because its smooth coat is easily covered, but is essential for rough-coated barley, loose-hulled oats, and the linty surface of cotton.

Precautions Recommended

In general, mercurials are recommended for small grains, flax, cotton, and safflower. Proper dosage is critical. Over-treatment may result in seed injury. Under-treatment may fail to adequately control disease. Seeds thoroughly cured, dried, and properly treated can be safely stored if these precautions are taken: (1) Insure good storage conditions since high temperatures and moisture favor seed deterioration and chemical injury. (2) Give particular care to treating. While there is roughly a 100 per cent margin of seed safety, injury is possible from overdosage or poor distribution of the chemical. Over-treatment cannot be removed by washing, because the mercury is absorbed by the seed coats. (3) Avoid mechanical injury to seed. It favors treatment injury, particularly when seed is initially stored under high temperature. Wheat injury can occur in thrashing (too high cylinder speed), resulting in skin breaks over the germ. Delaying treatment until cool weather permits safe treatment of such seed. Too severe debearding of oats causes treatment injury. Frosted seeds are more susceptible to mercury injury than sound seed. (4) Treated seed should not be held in air-tight storage. The normal methods of handling—open bins, sacks, and paper bags—are safe.

Non-Mercurials

The non-mercurial "protectants," based on such chemicals as thiram, captan, and chlorinil, are generally used for corn sorghum, field beans and peas, vegetables, peanuts, grasses, and small-seeded legumes. Both mercurials and non-mercurials may be used on sorghum, rice, and acid-delinted cotton seeds. Protectant effectiveness depends on complete coverage and higher dosages are generally required than for the volatile organics. The protectants have the advantage of an extremely wide margin of safety and lower health hazards. Treating rates may be adjusted to seeds' needs and to the expected severity of the planting conditions. There are no special storage requirements.

Certain other non-mercurials are used for special purposes on some of the crops normally treated with a mercurial. Copper carbonate controls stinking smut of wheat and kernel smut of sorghum, but has little seed protectant value. Hexachlorobenzene is a specific for stinking smut or bunt of wheat; but is not effective against the smuts of barley and oats and has little protectant value.

Insecticides

Insecticides are finding increasing use in seed treating. These may be merchandised in combination with the fungicide, as distinct products for individual use, or combined with the fungicide in the treating process. Uses include: Protection from storage insects, particularly various cereal crop seeds; from certain soil insects that attack the seed and germinating seedling, particularly sorghum, corn, beans, and vine crop seeds; and, protection of the growing plant through systemic action, such as with certain organic phosphates on cotton. The use of insecticides alone or with mercurials require special precautions for seed safety.

COST OF WEEDS IN CORN

Weeds cost U.S. corn growers about $440 million each year. Dr. W. C. Shaw of the USDA Crop Research Division arrived at this estimate as follows: (1) The 80 million acres of corn land are cultivated at least twice annually for weed control at an average cost of $1.50 per acre for each cultivation—a total of $240 million. (2) Weeds not controlled by cultivation compete with corn for soil nutrients and moisture, reducing yields an estimated two bushels per acre—an additional loss of more than $200 million.*

Today's best mechanical methods of cultivation and tillage, states Dr. Shaw, "give only partial control of the weed population in corn. Because uncontrolled weeds reinfest the soil by producing an abundant supply of seed, mechanical methods "are relatively ineffective in reducing weed seed population in soils."

As a result, there has been an increasing emphasis on chemical control. The discovery, development, and introduction of new herbicides in recent years "have exceeded the imagination" and new chemicals are being introduced "at a rapid rate." Herbicides are being applied to more than one out of 10 acres of cultivated land in this country, including 15 million acres of corn.

As Dr. Shaw points out, "weeds are a total farm liability and all crops grown on the farm are subject to their competition." Future developments must give greater consideration to weed control problems on the farm as a farm unit, rather than limit research techniques to the control of weeds in a single crop. The cost of corn weed control may appear high, because only one crop is being considered, "rather than the total weed problem." All too often, research scientists and producers similarly approach corn weed control "only when the weeds are present in the current crop."

To obtain more efficient and better balanced control in corn "farmers must be encouraged not only to use chemical weed control methods . . . in the current crop, but greater emphasis must be placed on the necessity of supplementing this program by the rotational use of herbicides on tolerant crops throughout the rotation."

* W. C. *Shaw*: Recent Advances in Weed Control Research, *Fourteenth Hybrid Corn Industry Research Conference, American Seed Trade Association, Chicago, Ill.*

RESIDUE ANALYSIS BY GAS CHROMATOGRAPHY

By J. J. KIRKLAND, Ph.D.
Research Scientist
Industrial and Biochemicals Department
E. I. du Pont de Nemours & Co. (Inc.)

Establishment of safe levels of modern biological chemicals in agriculture has required new analytical techniques capable of detecting minute amounts of chemicals in animal and vegetable tissues and in soil. A number of such methods have been developed by Du Pont scientists. The newest of these are versatile, accurate, and relatively routine gas chromatography techniques which measure minute amounts of residues in biological chemicals. Gas chromatography offers a number of advantages over other analytical methods:

1. Its high selectivity requires fewer preliminary isolation and separation steps.

2. Its general applicability eliminates the need to develop specific methods for each compound.

3. It will simultaneously detect several compounds, such as isomers, homologs, and "breakdown" products.

Fractional parts per million of residues can be determined with commercially available gas chromatography apparatus, using conventional thermal detectors. Sensitivity may be increased with ionization detectors. The detectability of residues is apparently fixed by the "background" of extraneous materials carried over from the tissue or soil, rather than detector response. Gas chromatography appears especially valuable for preliminary residue data on experimental compounds because of the short time needed to establish procedures.

The gas chromatography technique has been used to determine parts per million of an experimental biochemical in 3 cc. samples of animal blood in approximately 30 minutes of analysis time per sample. An alternate method for the same analysis requires about two hours.

Similarly, residues of the herbicides monuron and diuron can be simultaneously determined in soils and crops. Samples are refluxed in aqueous base to convert the urea herbicides to the corresponding anilines, which can be recovered and gas chromatographed. Good recoveries in the 0.3 to 0.6 p.p.m. range were obtained on 50 gram samples of soils and various crops such as cucumbers and peanuts. No other known methods are suitable for distinguishing these two herbicides when they occur together.

HIGH FERTILITY IMPROVES HAY QUALITY

A study was made to determine the effect of liberal nitrogen fertilization of Coastal Bermuda and Johnsongrass on feeding value and yield. Quality and yield are increased by high nitrogen fertilization. If high yields are to continue under heavy nitrogen fertilization maintenance, applications of phosphate and potash must be made. Earlier work showed that Johnsongrass should be cut in the boot stage for high quality hay. The meadow in this study was cut at the boot stage each cutting for nine years. Excellent stands were still present on the high fertility areas; however, on areas receiving no fertilization less than a 50 per cent stand remained. Coastal Bermudagrass hay cut on a five-week interval was found to be more desirable than cut on a four-week interval. Heavy fertilization is essential to obtain satisfactory yields and maintain stands of Johnsongrass hay cut at the immature stage necessary for the high productive value obtained in this study. Neither Coastal Bermuda nor Johnsongrass will make sufficient growth to maintain economical yields under the frequent cutting required for good quality hay without adequate fertilization. — AGRICULTURAL EXPERIMENT STATION, STATE COLLEGE OF MISSISSIPPI.

CHEMICAL SOLVES WEED PROBLEM IN VINEYARDS

The most difficult weed problem in the vineyard occurs under the trellis where weeds compete with vines for moisture and nutrients and hamper cultural operations. Studies in Ohio and other areas indicate that the herbicide, diuron (3-(3,4-dichlorophenyl)-1-dimethylurea), known as "Karmex,"* is valuable for controlling under-trellis weeds. It must be moved by moisture into the root zone of the weeds. Best results are obtained when diuron is applied before weeds establish extensive root systems. It is a relatively insoluble compound and will not penetrate the root zone of established grape vines in sufficient quantity to damage the plant. A single application can control weed growth for an entire season. On the basis of these tests and results of others, diuron is recommended in established vineyards. — OHIO AGRICULTURAL EXPERIMENT STATION, WOOSTER, OHIO.

* *Du Pont trademark*

USE OF UREA IN SHEEP RATIONS AIDS RESEARCH STUDIES

Recent studies indicate sheep will gain fairly rapidly when urea is the sole source of ration nitrogen, provided a highly alkaline mineral mixture is used. Such a diet will enable research workers to study the effect of mineral imbalances and, in particular, cation-anion balance. It will also permit study of symptoms of a single mineral deficiency. — AGRICULTURAL EXPERIMENT STATION, OKLAHOMA STATE UNIVERSITY.

RESPONSE OF TURF TO NITROGEN FERTILIZERS

Nitrogenous fertilizers can be grouped into three classes based on rate and duration of response of turfgrasses. Ureaforms gave the most gradual growth rate, and produced responses over the longest periods. Natural organics were intermediate, with responses influenced to a greater extent by environmental conditions. Greatest total growth was obtained from the soluble carriers, but was largely produced during 4 to 6 weeks following application, thereafter, growth fell rapidly. Single applications of soluble nitrogen carriers did not produce as uniform growth and quality through the season as the natural organics and ureaform products tested.

Response to ureaform compounds varied with their different availability indexes. Moderately high AI's (50 to 55) gave the most uniform responses during the full season. Higher AI's gave faster initial responses, followed by greater drop-offs, and those with lower AI's gave significantly lower seasonal responses. Response also varied with the amount of insoluble nitrogen in the ureaform. Materials with high contents (70 to 75 per cent) gave more uniform and persistent responses than those with lesser amounts. No consistent differences in growth and quality of putting green turf resulted from 8 to 10 pounds of nitrogen supplied per 1,000 sq. ft. in single or fall and spring applications of ureaform, in 5 to 6 monthly applications of natural organics, or in 10 to 12 bi-weekly applications of soluble materials.

Growth rate and quality of turf produced by any nitrogen fertilizer depend primarily upon how the material is used rather than the form in which it is applied.—AGRICULTURAL EXPERIMENT STATION, PENNSYLVANIA STATE UNIVERSITY.

INCREASED YIELD FROM SEED TREATMENT FOR POTATOES

Chemical treatment of cut potato seed gives good control of certain diseases and increases yields. This is particularly true under some conditions. For example, failure of treatment to increase yield when seed pieces are planted in an irrigated seed bed indicates that soil moisture is important in the parasitic activity of certain pathogens. This was apparent in the case of *Rhizoctonia solani*. Seed treated with "Semesam Bel"* seed disinfectant and held even as long as a month was equal to or better than seed treated with any of the other standard commercial seed piece treatments held for the same time.

Of all the treatments used in this study, only "Semesan Bel" plus Agrimycin resulted in appreciably greater yield if the seed pieces were held for ten days. Since "Semesan Bel" and Agrimycin have been reported to be effective in the control of black leg, seed piece decay, *Rhizoctonia*, and *Verticilium* wilt, and since their use may result in better yields than is obtained from untreated seed, it is recommended that the combination of these two chemicals be used for treating potato sets in Idaho. — AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF IDAHO.

* *Du Pont trademark*

SIMPLE AND INEXPENSIVE QUALITATIVE TEST FOR THIRAM

It has been common practice in recent years to apply certain organic compounds to planting seed as protection against plant diseases. Some seed protectants contain tetramethylthiuram disulfide* (thiram) as the active component. This simple and inexpensive qualitative test may be used to detect treated grains in poultry and livestock feeds: To 10 to 15 gm. of suspected grain or feed add 25 ml. of chloroform and shake for 3 minutes. This washes the grain or feed, dissolving the thiram (if present). Filter through cotton, then add a few crystals of cupric chloride and shake another 2 to 3 minutes. If thiram is present, a characteristic amber-to-brown color will appear in the chloroform as evidence.

In some cases, suspected grain already ground and included in the feed may also be tested. If feed contains alfalfa or other green plant color, the chloroform solution may appear green or yellow-green, and color will be darker — a muddy brown in the presence of thiram or a muddy green to yellow-green if no thiram is present in the sample. — AGRICULTURAL EXPERIMENT STATION, TEXAS A. & M. COLLEGE.

* *Du Pont manufactures "Arasan" thiram seed disinfectant and protectant*

CONTROL OF FLUE-CURED TOBACCO DISEASES, 1949-59

Root knot nematodes and weeds are successfully controlled in plantbeds by treating the soil with nematocides and herbicides well in advance of seeding. A soil drench with a formulation containing four pounds of sodium-methyldithiocarbamate dihydrate (SMDC)* per gallon was highly effective against weeds but gave only partial control of root knot. The optimum rate was nine quarts in 100 gallons of water, poured uniformly over a 100-square yard area. Additional water was sometimes applied to provide a seal. Good results also were obtained with only nine pints in 25 to 30 gallons of water and sprinkled over 100 square yards, but only when a polyethylene or similar cover was rolled over the surface as rapidly as treatment was applied. The cover was left four days before and seeds were sown four to six weeks later. — AGRICULTURAL EXPERIMENT STATION, UNIVERSITY OF GEORGIA.

* *Du Pont manufactures VPM sodium-methyldithiocarbamate soil fumigant.*

"THYLATE"* FOR AZALEA PETAL BLIGHT CONTROL

The fungus of petal blight (*Ovulinia azaleae* Weiss) lives from season to season on infected blossoms, where it forms small black, disk- or cup-shaped reproductive bodies, called sclerotia, embedded in the dead petal tissue. Sclerotia fall to the ground and some survive the winter, giving rise the following year to fruiting structures that produce spores capable of infecting new blossoms. Once established, the disease may be spread by visiting insects, rain, and wind. Spread is very rapid when conditions are favorable. The only effective control is a fungicide designed to protect the flowers from infection. Fungicides are not very effective once a blossom is infected. Thorough coverage of the flowers is, therefore, important if such protection is to be provided.

Outstanding results have been obtained for control of azalea petal blight with "Thylate," a formulation of thiram. "Thylate" at 1 lb. per 100 gal. of water (2½ tsp. per gal.) provided longer protection, was less toxic to the plant, and left less visible residue on the blossoms than the other sprays, nor did it detract from the brightness of the flower. "Thylate" applied soon after the flower opened, appeared to give the necessary protection to allow the blossom to live out its natural life span with a minimum of further spraying, in spite of considerable rainfall and weathering that would be expected to weaken its effectiveness.—DEPARTMENT OF PLANT PATHOLOGY AND PHYSIOLOGY, MISSISSIPPI STATE UNIVERSITY.

* *Du Pont trademark for thiram fungicide.*

WHO WANTS WAR?

By CRAWFORD H. GREENEWALT
President
E. I. du Pont de Nemours & Co. (Inc.)

Perhaps because war represents the ultimate disaster to the civilized mind, the Communists have concentrated much of their anti-Western propaganda on the charge U. S. industry seeks war. With this, Khrushchev and his cohorts seek to achieve two results with one line: To discredit the free enterprise system which has made us economically and military strong and to weaken the resistance of the West to Communist aggression.

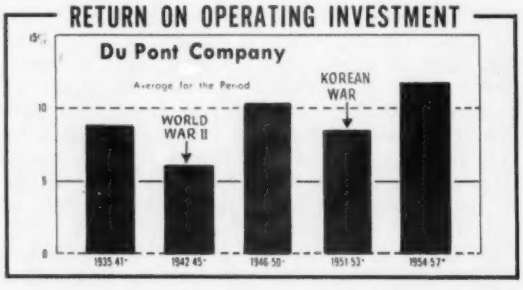
To answer this propaganda assault, the U. S. Department of State has asked Du Pont President Crawford H. Greenewalt to express the view of an American businessman on the meaning of war. The following is a summary of his talk to the nations of the free world.

It should be perfectly obvious that only a psychopath can regard war as anything else but calamity, or the need for armaments as anything more than an unfortunate necessity. The accounting of war in terms of human suffering and in the degradation of human ideals is beyond all reckoning, and is no less so to those individuals who make up a business institution than to any other segment of society; loss and bereavement visit equally upon a people regardless of calling or position. One of the unfortunate fallacies of the day is the supposition that a business concern has a life and a will independent of its human components. The fact is that the businessman, the devoted parent, and the patriotic citizen are one and the same person.

The really staggering losses, aside from those represented by humanitarian aspects, lie in the diversion of man's efforts from the elevation of the race to its destruction. The dilution of scientific effort and distraction of attention from the long-term goals of peace to the immediate goals of war impose a penalty all the more intolerable because it can be counted only in terms of lost opportunities for achievement, in the gains we may never realize, in blessings we may never know. In World War II, at one point, not less than 85 per cent of Du Pont's research effort was engaged directly in the war activity and, by the war's end, virtually all personnel was so occupied to greater or lesser degree.

The affect of this widespread diversion upon the company's progress is more than sufficient to set at rest any inference that a responsible concern should find war desirable. Research cannot be placed in moth balls "for the duration" or "reconverted" afterward without loss of momentum and direction. Nor is scientific research, as conducted by the large companies, a compartmented structure in which one activity can be carried on independently of others. When Du Pont, at the urgent request of the government, undertook a major role in the atomic energy program, it was necessary to draw upon almost every other sector of the company to create an appropriate technical staff.

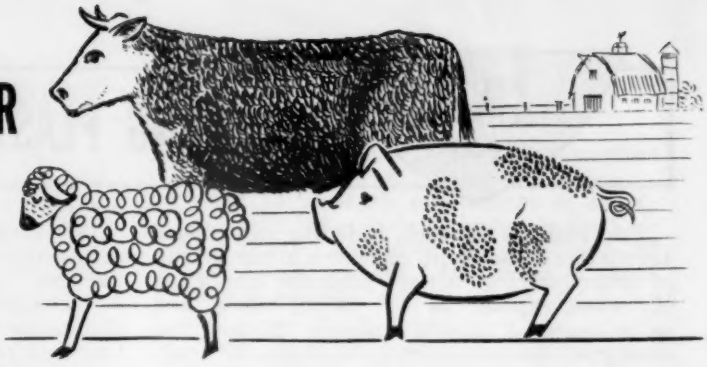
The charge that "business" somehow benefits by war is a stark illusion. Our laws quite properly hold that even normal profits from military production are contrary to the public interest, and appropriate steps are taken under the renegotiation acts to limit earnings on materials which, directly or indirectly, enter into the war effort. Since this includes nearly everything, any company, during wartime, necessarily suffers some economic losses. Over a long period, our net return on investment has averaged close to 10 per cent. For the war years of 1942 to 1945, this return was under 6 per cent and suffered another sharp decline during the Korean War years.



When the nation is threatened, industrial organizations set aside their own purposes to perform, like any citizen, a simple duty. Many times in the history of the United States, the industrial establishment has been called into service and has proved a decisive factor. Yet always the sword has been forged at the expense of the plowshare.

Business institutions prosper and flourish, not on short-lived opportunistic endeavors, but on a usefulness continued over a long period of time, a usefulness based on the fulfillment of basic human needs. To the extent that the energies of any concern must be directed elsewhere, it is the loser, not only in the rewards of the present, but in future potentialities.

METHOXYCHLOR FOR CONTROL OF LIVESTOCK PESTS



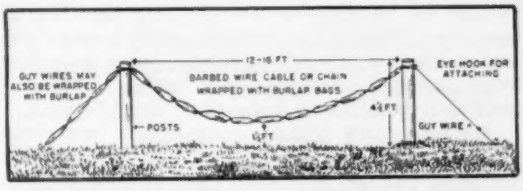
Perhaps one of the most irksome problems in the handling of livestock prior to slaughter is the need to keep animals free of pesticides within the legally-required time limits. This means that the farmer must keep track of the last date of application and, frequently, animals destined for slaughter must be carefully segregated from those still subject to treatment.

The only chlorinated hydrocarbon insecticide commonly used for control of hornflies and other insect pests infecting livestock which is not restricted during the pre-slaughter period is methoxychlor. Its use up to the day of slaughter is possible because the chemical does not tend to accumulate in any great degree in the animal fat tissue, but is rapidly eliminated from the animal's body. Furthermore, the Food and Drug Administration several years ago established a tolerance of three parts per million in the meat of cattle, hogs, and sheep.

Long Effectiveness

Methoxychlor has the additional advantage of long residual effectiveness, perhaps the longest of any of the pesticides recommended for hornfly control. Thus methoxychlor eliminated the pre-slaughter control problem plus making it possible to reduce the number of applications, reduce labor, and avoid some of the "wear and tear" on animals which may result from more frequent treatment.

A recent announcement by the Mississippi State University states that "research work has shown that methoxychlor will give approxi-

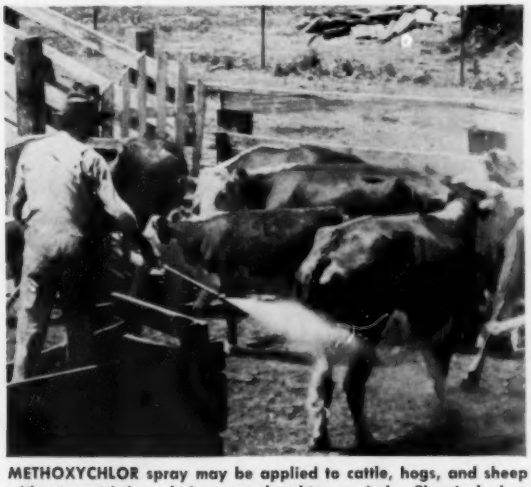


BACK RUBBER for automatic fly control is easily constructed. Burlap is saturated with methoxychlor mixture and the insecticide is applied whenever beef animals rub up to scratch themselves.

mately 28 days of control" of hornflies on beef animals, seven days longer than the maximum listed for other products.[1] Hornflies on beef cattle may be controlled either through spraying, dipping or dusting with methoxychlor or use of backrubbers.

In the case of cattle lice, the U. S. Department of Agriculture recommends methoxychlor as a spray, as well as by dusting or self-treatment.[2]

Two Du Pont methoxychlor insecticide formulations are recommended for use on meat animals. "Marlate" 50 methoxychlor insecticide is a wettable powder which may be used as a dust, or mixed with water for spraying of beef cattle, hogs, and sheep. "Marlate" 2-MR is an emulsifiable oil formulation which can be used in sprays for hogs and beef or back-rubbers for beef. It is diluted with four parts fuel oil per one part of "Marlate" 2-MR when used in back-rubbers.



METHOXYCHLOR spray may be applied to cattle, hogs, and sheep without restriction during pre-slaughter period. Chemical does not tend to accumulate to any degree in animal fat issue.

REFERENCES

[1] *Extension Service, Mississippi State University: Bug Reminder, June, 1960.*

[2] *U.S.D.A.: Cattle Lice: How to Control Them, Leaflet 456, January, 1960.*

PROPER TECHNIQUE FOR

BUILDING PLASTIC GREENHOUSES

Two years of research, including tests under severe Florida sunlight, indicate a minimum life of four years for "Mylar" polyester film, Type W, when exposed at 45° facing south, and seven years for vertical exposure. "Mylar", the strongest film commercially available, is unaffected by bacteria or fungi, will not become "baggy" as a result of temperature or humidity changes, and maintains its strength at temperatures from —60° to +200° F. These properties make Type W suitable for outdoor applications, especially low-cost greenhouses.

Commercial and university construction tests have developed installation techniques and construction details essential to obtaining the full life expectancy of "Mylar". Roof covering should be lengthwise, overlapping the film at each run. This is the easiest, neatest, and fastest method, and eliminates nail holes near film edges, as well as edges under batten strips, and makes it possible to draw film "drum" tight.

Rafters and other supporting members should be fitted carefully so that film may be installed flat and protected against damage. For best snow removal and condensation runoff, roof pitch should be at least one foot of drop for two feet of ridge-to-eave distance. Rafters should be spaced no more than 36 inches apart.

Unroll film to the length of the greenhouse, plus two feet for gable overlap and the "pull-tight" device. The first length of film is run along the roof at the eave, allowing about three inches to overhang the eave and six inches to overlap each end rafter. Mount a batten strip extending to the top edge of the film at the far gable, using coated fourpenny nails spaced three to five inches, and staggered (Figure 1).

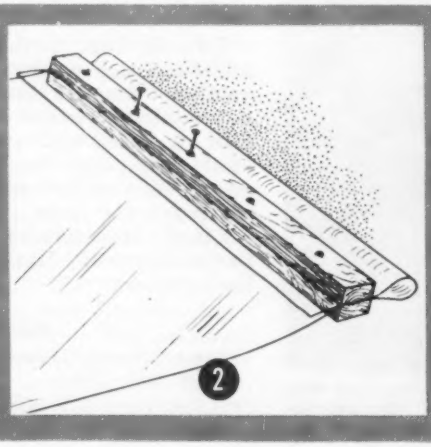
Do not nail within four inches of the top edge of the film because the next run must slide under this batten to overlap. To keep film taut, a stretcher loop is made in the free end of the film, using two 2x3's as a clamp (Figure 2). A length of pipe is passed through the loop to allow use of fench stretcher (Figure 3).

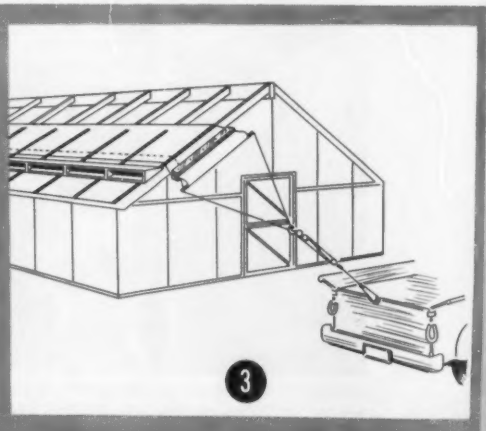
After the far end is fastened, the film is pulled "drum" tight, and every fifth batten nailed down. Intermediate battens are then nailed and the stretcher and clamp removed, allowing six inches of film to overhang the end rafter. This is done for each succeeding run of film. Overlapping film at the ridge is fastened with a batten strip. Sides may be glazed the same way. Overhanging film from sides and roof is now wrapped around end rafters and studs, and stapled. Gable ends are glazed last, with film installed either vertically or horizontally. Battens are used to secure the film at eave junctions.

Rot-proofed structural lumber, number one, common grade, is adequate for framing, or redwood may be obtained at higher cost. It is best to paint the frame with a greenhouse paint to prevent moisture penetration.

Installing a layer of two or four mil Du Pont polyethylene film on the inside of the greenhouse can reduce heating costs by 30 to 40 per cent and will help eliminate condensation. Because the polyethylene film is protected from harmful sunlight by the "Mylar" polyester film, it will last indefinitely.

An illustrated booklet on glazing greenhouses and coldframes may be obtained from: Editor, *Agricultural News Letter*, Du Pont Company, Wilmington 98, Del.





Farmers Ask About . . . .

Q: Where did the apple maggot originate?

A: The apple maggot or railroad worm is a native of the northeast U. S. and eastern Canada. It began to infest apples in New England about 100 years ago (its original food being wild haws and crab apples), spreading to all major U. S. apple areas.

* * * * *

Q: What is the most destructive plant pest?

A: The nematodes, which destroy an estimated 10 per cent of the world's food production.

* * * * *

Q: Why was fertilizer use higher in 1959?

A: The 13 per cent increase in 1959 was largely the result of increased use on cotton and corn.

* * * * *

Q: Did Du Pont make record profits this year?

A: Although sales for the year so far are at an all-time record high, the Company's profits are six per cent below those of 1959.

* * * * *

Q: What is the U. S. cattle population?

A: Over 100 million head, a five per cent increase over the previous year.

* * * * *

Q: Can beef tenderness be measured objectively?

A: The USDA has developed a hydraulic pressure device that measures tenderness with small samples of raw or cooked meat.

* * * * *

Q. How can I control peach scab and brown rot?

A: Du Pont "Thylate" thiram fungicide is suitable. An Oklahoma study, for example, produced 98 per cent "clean" fruit with treatment, compared to 19 per cent for controls.

* * * * *

Q: What are the symptoms of fusiform wilt in pine trees?

A: This dangerous disease causes cankers which may eventually result in the death of trees. It is controlled by pruning of infected branches and of trees with trunk cankers.

* * * * *

Q: Are Du Pont Company prices still declining?

A: Yes, they are. The average price of Du Pont products now sold is somewhat lower than a year ago. The current index is actually below the level of 1949.

Q: How much food does the average American consume in one year?

A: About 10 times his own weight or an average of 1,500 pounds, according to the Federal Trade Commission. In a lifetime of "three score and ten," this comes to about 100,000 pounds.

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Q: How much of the consumer dollar spent for tobacco goes to the tax collector?

A: Almost 40 per cent, or $2.7 billion of a total expenditure of $6.8 billion. Growers received less than half that sum, $1.1 billion.

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Q. Is iodine deficiency a factor in calf hydrocephalus?

A: An Oregon study indicates that iodine prevents enlargement of thyroid glands and "water on the brain" in calves.

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Q: How many establishments does the U. S. chemical industry have?

A: About 12,000, according to the Census Bureau.

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Q: What is the cause of the low oat crop of some eastern states this year?

A: The spring oat crop of Maryland, New Jersey, New York, and Pennsylvania has been seriously affected by the so-called "yellow dwarf" disease carried by aphids. Yields have been reduced as much as 25 per cent.

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Q: Is Du Pont employment greater than last year?

A: Yes. The latest figures show over 89,000 employees, six per cent more than 1959.

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Q: Is it best to fertilize Kentucky Bluegrass lawns in spring?

A: The best way, says the USDA, is to fertilize bluegrass and red fescue half in September and half in October. This helps reduce leafspot incidence compared with spring fertilization.

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Q: Is the coffeebean weed poisonous to hens?

A: No, according to the South Carolina Experiment Station. The culprit is actually crotalaria seed, which can reduce egg production or even kill birds.

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Q: Do dairy cows with high production "burn out" sooner than others?

A: Not according to the USDA, which reports that high producers seem to "outlast" low producers.

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